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ABSTRACT

The fields of social and cognitive psychology and political science have offered several experimental designs for assessing the presence, type, and complexity of scripts (memory structures used to encode knowledge of an action) or event schemata. Script measurement is a potentially valuable tool for the study of information and news processing because the mass media typically present action-based sequences similar in nature to scripts. Most of the studies aimed at demonstrating the presence of a schema rely on hypothetical passages and indirect measurement strategies based on recall tests, clustering of related concepts, and inference based on prior knowledge. The study of information processing has focused on consensual or shared schemata--similar images for action-based or event stimuli shared by people in general. Media researchers are especially concerned with the assumption that people select specific schemata when processing various types of information supplied by the media--politics, sports, and weather, for example. The external validity of schema measurement has not been sufficiently assessed, though internal validity is rarely a problem in properly conducted experimental research characterized as a posttest only control group design. For the study of news and information processing, external validity should be sought using real news and information for stimulus material rather than hypothetical passages. References are included. (SRT)

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METHODOLOGICAL APPROACHES TO SCHEMA MEASUREMENT:

Applying 'Script' Measures to Mass Media Information Processing

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ABSTRACT

Schema measurement is a new frontier for communication and social cognition researchers. Recent research provides evidence that the schema concept may have significant utility in terms of explaining the processing of news and information in the mass media. But a variety of scholars have argued that adequate measurement approaches must be linked to the schema construct if it is to move toward acceptance as a formal theory. This report addresses this point.

Researchers in the domain of cognitive social psychology and political science have offered measurement approaches aimed at assessing the degree to which people employ consensual schemata. These approaches are rooted in conventional measurement techniques such as recall examinations, cluster analysis and inferential testing. This paper will offer a critique of these methods and provide a set of hypothetical examples illustrating the manner in which communication and mass media researchers may benefit from script measures.

PURPOSE

The purpose of this report is to review and explore the various approaches to schema measurement. The specific form of schema measurement to be considered is that of event schemata or 'scripts.' Both terms are synonymous and refer simply to action-based schemata. Schank and Abelson (1977) use the term script to refer to the memory structure a person uses in encoding his general knowledge of a certain situation-action routine. Approaches to 'script' measurement will serve as the focus since news and information provided in the mass media is typically presented in action based sequences similar in nature to scripts as conceptualized by Schank and Abelson.

Social psychologists and political scientists have offered several experimental designs aimed at assessing the presence, type and complexity of scripts. Experimental approaches permit manipulation of messages. Only a single study of interest to media researchers has utilized survey data in the course of schemata measurement (Lau, 1984). Graber (1984) used the schema construct to explain the findings of her panel study on political information processing, but she made no attempt to quantify the schemata used by the members of the panel.

The experimental design typically employed might best be described as conforming to the posttest-only control group design. Campbell and Stanley (1966) explain that true experimental designs employ methods of randomization to assure that all groups are equal prior to introduction of the stimulus. Most of the work in schema measurement has conformed to this

requirement. But recent experiments have emphasized individual difference among groups studied leading to assignment to a treatment group based upon a variable such as expertise. These emerging measurement approaches rely on quasi-experimental approaches. Therefore, script measurement is possible in both experimental and quasi-experimental settings.

Virtually all of the experimental research approaches involve instructions to subjects designed to invoke a specific schema. Stimulus materials (normally in the form of a topical text concerning the schema hypothesized schema) are then introduced to the subjects. The subjects are then tested to evaluate presumed script guidance of message processing. Measures commonly used include: 1. recall tests; 2. clustering of related concepts and 3. inference based on prior knowledge.

This paper is concerned with schemata measurement as it applies to communication and mass media researchers. The focus will therefore center on script measurement--a specific type of schema measurement. Following a general overview of script measurement approaches, the focus of this report will shift to an assessment of political schema measurement. Processing of political information has been singled out since it accounts for the greatest volume of news and information provided by the media. In addition, some work in political script measurement has already been conducted providing a foundation upon which to build. Hypothetical examples will be provided during the course of this report to facilitate an understanding of the experimental designs and methods to be introduced.

SCHEMA THEORY: THE USE OF INDIRECT SCHEMATA MEASURES

Detailed theoretical analyses of the schema concept have been provided by authors in social psychology (Fiske & Taylor, 1984; Hastie, 1981; Norman & Bobrow, 1975), political science (Axelrod, 1973; Lau, 1984) and communications (Reeves, Chaffee & Tims, 1982). Several plausible models detailing the schema activation process have been suggested by these authors. But these theoretical models must be supplemented with workable research designs and measurement approaches to be of utility.

Researchers have alternately used terms such as prototypes (Cantor & Mischel, 1977) and social scripts (Schank & Abelson, 1977) to describe active information processing and retrieval. Indeed, Lippmann first wrote of stereotypes--a precursor to the schema notion--in 1922 in his classic work Public Opinion. Schema theory suggests that in the course of information processing, individuals with expertise in a given topical domain typically utilize several schemata rather than a single schema. Conversely, people with limited experience in a domain typically use fewer schemata (or a single schema) in evaluating information.

The abstractness of the schema concept prompted early researchers to simply 'assume' the presence of schemata in information processing. This assumption stemmed from the unavailability of techniques capable of getting inside peoples' minds to evaluate the presence or sophistication of a particular schema. But during the past decade, several indirect approaches

to schema measurement have been employed that to some degree circumvent this problem. These techniques have helped solidify the foundation upon which the schema notion rests.

While less than perfect, these indirect measures provide the pathway whereby the schema notion may move toward acceptance as a formal theoretical construct. Most of the studies aimed at demonstrating the presence of a schema rely on measurement approaches that test recall, evaluate inferential capabilities and assess the tendency of an individual to cluster related concepts.

Cognition researchers propose that high recall of information is related to well developed schemata since new information is assimilated easily into a developed schema. Clustering of concepts measures the manner in which people group related concepts together. Inferential abilities are assumed to represent schema presence and sophistication since people with well developed schemata for a particular domain typically find it easier to draw on past experience to fill in missing information. Researchers typically use several measures concurrently to test the validity of the scores obtained. A close watch is always kept on the experimental design to assure reliable results.

The communication field has a rich research tradition in evaluating the effects of media messages on audiences and the society. Research has focused on topics such as the impact of television on children and potential for media inspired social behavior. Much of this work is based on theoretical and methodological approaches advanced in social psychology. Schema

theory and measurement offers the promise of putting this past research into context. It promises explanations as to why certain messages have an effect on certain people leading to specific responses and behavior. Schema theory offers the potential to explain different impact of messages on different members of the audience. Quantitative measurement offers the prospect of assessing the degree to which people consensually employ scripts in information processing. While less precise than measuring column inches in a newspaper or counting stories on the evening news, schema measurement promises useful information on the extent to which the messages serve a purpose.

Social psychologists suggest that several concurrent indirect measures such as recall, inference and clustering offer evidence that people indeed call upon similar or different schemata in the course of information processing. Schema measurement concerns measuring the presence of generic knowledge structures--not specific knowledge in a given topical domain. Researchers have typically invoked a schema--democracy for example--and then assessed the manner in which people evaluated information based upon the invoked construct.

Experimental approaches have been the mainstay of schema measurement techniques. But recent researchers have also begun to utilize survey approaches with some success. A measurement model based on survey data will be evaluated presently. The experimental approaches will be evaluated subsequently.

THE SURVEY APPROACH

Lau (1984) utilized open-ended survey questions from the Center for Political Election Studies (CPS) at the University of Michigan as a gauge of schemata. Each of the survey questions introduced one of the four categories (issues, groups, parties or candidate personality factors). The precise wording of one question was as follows:

Now, I'd like to ask you what do you think are the good and bad points about the parties. Is there anything in particular that you like about the Democratic Party? (If yes:) What is that? Anything else?

Up to three responses were recorded. The questions provided the label for the schema--in this case Democratic Party. Respondents answered the questions based on upon the sum total of all of their knowledge concerning political parties. This method of inquiry is known as cued-free recall. Taylor and Fiske (1981) suggest that this method is one of the least precise measures of schema content.

Lau (1984) acknowledged the limitations and deficiencies of this technique suggesting that the responses inevitably "must include a good deal of random noise, which will decrease the power of the analyses to find significant effects." Common sense provides most people with something to say about a 'political party' or a particular 'politician' when provided with the label--if for no other reason than to avoid creating the impression that they are uninformed. Recent work by Graber (1984) supports this proposition.

Schema theory rests on the assumption that general knowledge

structures guide processing of specific information. In order to test this proposition, specific information must be provided to the respondent and then followed up with measures believed to assess information processing capabilities. Accurate and articulate responses to survey questions may indeed demonstrate the presence of a well developed schema. However, researchers must once again resort to simply assuming that it is the schema (and not specific knowledge) that has been tapped. The next section of this report will endeavor to demonstrate that experimental procedures, with their manipulative capabilities offer more promise for the study of event schemata.

THE EXPERIMENTAL APPROACH

The bulk of literature on schema measurement comes from social psychology, a science steeped and deeply rooted in the experimental tradition. Most schema research designs query individuals on a specific set of information or a 'knowledge set' which has been provided by the experimenter. This enables the researcher to evaluate recall based upon the specifics of the information provided. This approach guards against purely conjectural or impromptu answers.

Subjects are typically presented with an unfamiliar knowledge set and then asked to answer questions or draw inferences. Schema theory suggests that individuals possessing a well defined schema in that domain will have more success at recall of related information, infer more and tend to cluster related concepts more than individuals with an ill defined schema. It is this introduction of the knowledge set that makes

the experimental approach superior to the survey approach. Individuals are required to recall, cluster and infer based upon a specific knowledge set. Survey techniques draw upon a more general knowledge. Thus, individuals with well defined schemata in a given topical domain will process new information related to that domain better than individuals with an ill defined schema. Unlike the survey technique, it is possible to evaluate with greater precision the amount of a specific set of messages that was processed.

Experimental approaches represent the most recent advances in the area of schema measurement. A variety of scholars have recently offered improvements on some of the earlier and less precise measurement methods (Cantor & Mischel, 1979; Conover & Feldman, 1981; Markus & Smith, 1981; Ostrom, Pryor & Simpson, 1981). The literature employing experimental approaches clearly outstrips any other approach to schema measurement. The logical starting point in this inquiry into measurement approaches requires the specification of variables used in past research. Most studies in the past have manipulated either the perspective of the individual or the label for a particular schema. These manipulations have served as the independent variables.

The amount of recall, inferential abilities and clustering of concepts have traditionally served as the dependent measures. The oldest literature on measurement of consensual scripts is barely a decade old. A review of this emerging body of research literature may be in order.

LITERATURE REVIEW OF EXPERIMENTAL APPROACHES

Fiske and Kinder (1981, pg. 173) report that research interpreted "in schema terms has demonstrated a preference for testing and refining general principles of information processing." Much of this work has focused on consensual or shared schemata. Experiments on consensual schemata have tested the hypothesis that people share schemata--that people in general conjure up similar images for action based or event stimulus domains. Abelson and Schank (1977) propose that part of our knowledge is organized around hundreds of stereotypical situations with routine activities. Examples would include visiting a dentist or ordering a meal in a restaurant. This proposition is supported by a series of recent studies (Anderson and Pichert, 1978; Bower, Black and Turner, 1979; Fiske, Taylor, Etcoff and Laufer, 1979). But more recent work also suggests that individual differences provide for substantially different levels of processing of information based on script development (Fiske, Kinder & Larter, 1983; Graber, 1984; and Markus, 1977).

Bower, Black and Turner (1979) suggested that consensual scripts are rooted in a form of 'cultural uniformity' which tends to cause people to share perceptual stereotypes concerning the manner in which certain routine typical events unfold. They hypothesized that subjects presented with a hypothetical scenario will add information or misremember facts from a story based on what they expected to transpire. The researchers operationalized their hypothesis by asking student subjects (N=161) to generate a

script (dependent measure) based on their expectations of how a series of common events such as "ordering a meal in a restaurant" (independent variable) should unfold. They then assessed the consensual agreement on characters, props, action contained and the other elements of the stories generated.

But they went further than simply reporting that people tend to conceptualize social information in a similar fashion. The researchers tested recall on implied information by asking a second set of respondents (N=18) to read a series of 18 short stories. Each story was different but many were related in terms of general themes. For example, stories entitled "The Doctor, "The Dentist" and "The Chiropractor" were all included. The subjects then wrote down all of the information they could recall about certain stories. The results were subjected to an ANOVA in which stated actions were compared to unstated script actions and finally to other actions.

In another experiment, Bower, Black and Turner (1979) asked subjects (N=12) to study two sets of actions--one set containing actions for a script in a logical order and a second set with the action items incorrectly arranged (independent variable). They then asked the respondents to arrange a set of cards describing the actions in the original order (dependent measure). The results were analyzed using ANOVA to determine whether people misremember information to make it conform to the anticipated script.

Anderson and Pichert (1978) looked at the processing of goal directed social events in another set of experiments. The

dependent measure was level of processing based on information salience rooted in the directives of the researcher. The independent variable was goal directed processing operationalized by asking respondents to assume a given perspective. Students (N=12) read a story about the behavior of two boys while skipping school. The action in the text was set in the home of one of the boys. The passage contained information of interest to a perspective home buyer and a burglar. A total of 72 facts (or idea units) were provided.

Half of the students were assigned to the group asked to read the text from the perspective of a burglar (burglar schema) and the other half read it from the perspective of a home buyer (home buyer schema). Then they wrote down all they could recall about the story. After a distractor task, the students were again asked to recall facts from the story but half of each group was told to do so from the other perspective. The researchers then tallied the recalled facts from the differing perspectives to evaluate whether or not processing was different depending upon the perspective of the individual attempting to retrieve the information. An ANOVA performed on the data suggested that instructions to take a new perspective led subjects to invoke a schema that provided cues for processing of different categories of story information.

Fiske, Taylor, Etcoff & Laufer (1979) explicitly instructed student subjects (N=50) to take the point-of-view of individuals in a text they provided. The researchers instructed the students to imagine an accident from the point of view of the motorcyclist

or the cabbie involved in the mishap or from the perspective of a spectator. The set of experiments were designed to test recall based on visual point-of-view influences. The students answered a series of questions based on a text they had read about the accident. The questions probed specific details such as memory of the events leading up to the accident. The students then assessed responsibility for the accident to one of the drivers involved. The recall and attribution data were each analyzed separately.

The independent variable in this experiment was the perspective of the person reading the text. The dependent measures were drawn from the answers to the open-ended questions. An ANOVA involving recall suggested that recall is enhanced based on visual perspective and goal orientation. Of prime concern in this study is that people selectively processed visual cues when all of the information was semantically equal. Each student was instructed to read the text from a particular point-of-view. Specific groups of people processed information in a similar manner based on a point-of-view scheme invoked by the researchers.

These experiments have tended to demonstrate that people apparently conceptualize simple action-based routines in similar fashion. But what of more complex scripts? Can we ignore the fact that individual differences in people may cause script variation based upon socio-cultural differences in people?

It is this very point that Markus addressed in her pioneering work on individual differences in self-schemata

(Markus, 1977; Markus & Smith, 1981). Markus hypothesized that self-schema will determine the type of self-judgments that are made and that these judgments will vary in latency depending on the presence and content of self-schemata. She also predicted that individuals with self-schemata (operationalized as highly dependent or independent) should find it easier to describe specific behavior that is related to their schema and should be relatively more certain about prediction of their behavior along this dimension than individuals with an ill-defined self schema.

Markus (1977) demonstrated that people process information differently depending upon the degree to which a particular stimulus domain is salient. She used the term 'schematic' to refer to individuals with significant interest or knowledge in a particular stimulus domain. 'Aschematic' conversely refers to individuals with little or no knowledge or interest in a particular domain. The specific design and measurement techniques utilized in this research are of little importance for media researchers since design and measurement techniques employed in the evaluation of self-schema are strikingly different from those employed in script analysis. But this work is distinguished because of the design and measurement considerations--that of individual differences--are clearly an element of concern to news and information providers.

Markus provided a foundation upon which others have built. Chi and Koeske (1983) proposed that knowledge possessed by experts (in a given topical domain) is denser (they possess more knowledge and concepts are better integrated) than knowledge

possessed by novices in that domain. Their work reflects a basic underpinning of schema theory--that 'experts' may be expected to draw on more schemata when processing information than will 'novices.' It should be noted that use of the novice (aschematic) and the expert (schematic) dichotomy is not intended to imply that all people can be neatly categorized as one or the other. Categorization of people simply represents two poles on a continuum, thereby establishing the variance essential for experimental research.

Fiske, Kinder and Larter (1983) suggest that political understanding depends vitally on past experience and that individuals will vary enormously in both the availability of schemata and how available schemata are used. The "politically involved should differ from the uninvolved in their processing of information about politics: in the nature of schemata available to them, in the ease by which such schemata are invoked, and the facility with which such schemata are employed in information processing." As such, assimilation of information should be facilitated if an individual is politically astute.

Fiske, Kinder and Larter (1983) designed a series of experiments intended to evaluate specific differences in political information processing. They assembled a group of political 'experts' and a group of political 'novices.' They operationalized this concept by evaluating individual levels of political involvement using standard measures provided by the Center for Political Studies at the University of Michigan. The researchers predicted that political experts and novices would

both use information consistent with their shared prior knowledge set. But they hypothesized that the experts would also use information inconsistent within the knowledge set provided. This was tested by asking students (N=82) to participate in a media study. The researchers prepared a text about Mauritius, a little known country in the Indian Ocean. The text was laden with concepts tending toward democratic and communistic forms of government. The opening sentence of the text manipulated the knowledge set by suggesting the country was communistic, democratic or neither (independent variable).

The students were then asked to recall as many facts as possible. They also made inferences about the country by providing answer to questions not included in the text. Amount of recall was measured by counting the facts recalled and submitting the recall data to an ANOVA on knowledge (communist/democratic/neither) by expertise (high/low) by information type (communist/democratic). Inferences were analyzed using an ANOVA on knowledge set (communistic/democratic/neither) by expertise (high/low). The researchers also utilized a measure of conceptual clustering (Adjusted Ratio of Clustering) which measures the manner in which like concepts cluster together.

The relevance of all of the individual difference studies has been summarized (Fiske & Kinder, 1981, pg. 177).

"Through practice, experts acquire more-and more complexly organized knowledge, which includes strategies for dealing with particular domains. These knowledge structures-in our theoretical vocabulary, schemata-encompass both declarative knowledge (descriptions of attributes) and procedural knowledge (rules or strategies for the use of that knowledge)."

These experiments suggest that people tend to conceptualize action based routines in a similar fashion based in large part on cultural norms dictated by the society. Yet differing social roles (among other reasons) accounts for individual differences in people. Thus schema measurement offers the opportunity to assess the degree to which people share action based stereotypes. Script analysis provides a specific blueprint for assessing what information is assimilated easily for audience segments or aggregates. However, each topical domain must be explored individually. This suggests that instead of simply querying people on general information preferences such as feature stories versus political news, it is essential to dissect each main type of news. Such an approach will inevitably involve considerable refinements of the measurement approaches that have heretofore be explored.

Political information will serve as an appropriate starting point in this endeavor since some work in this area has already commenced. The following section will provide a detailed rationale for the selection of political information.

SCHEMA USAGE IN POLITICAL INFORMATION PROCESSING

Scholars since Lippmann (1922) have proposed that people use schemata in the course of news and information processing. But of concern to media researchers is the assumption that people select specific schemata when processing various types of information (politics, economics, sports, weather, etc.) supplied by the media. Schema measurement hinges substantially on the

identification and measurement of consensual schema usage among audience members.

Political information offers promise with regard to schema measurement for the following reasons.

1. Political schemata have been studied and analyzed in the political science literature: As such, suitable measurement models may be applied in attempting to segment audiences based on consensual schemata.
2. Proliferation of political information: Political information seems an appropriate starting point in analyzing the manner in which information and consensual schemata interact since political news and information is presented with greater regularity than any other type of information.

Political information is all around us. Gans (1979, pg. 16) reports that approximately 35% of all of the news stories on evening (network) news programs are political in nature. If other politically tangential types of news stories are included, the figure rises to above 40%. A more recent content analysis (Wicks, 1985) suggests that 30% of the stories on American (network) newscasts are primarily political and 53% deal tangentially with politics. The sheer volume of political messages to which people are confronted on a daily basis makes it an ideal choice for the study of applying schema theory to news and information processing.

Political information provides an excellent opportunity for the study of schema measurement for a variety of other reasons as well. Most Americans remain rather indifferent to, and generally poorly informed about, much of what transpires in the political world despite the sheer volume of political information to which

the average person is exposed (Converse, 1975; Sears, 1969). The average person is extremely selective when approaching the menu of political information available (Graber, 1984). The potential for obtaining political information is relatively high but the average person's typical investment in developing political expertise is relatively low (Converse, 1975; Downs, 1957; Lippmann, 1922).

But while many people may process relatively little political information, political experts (Fiske, Kinder & Larter, 1983) apparently process and retain political information with relative ease. The political expert is believed to employ a greater number of schemata in the course of information processing than does the novice. Politics allows the ready assemblage of groups with widely divergent processing abilities.

Graber (1984) is perhaps the first and quite possibly the only researcher to thus far conceptualize the applied significance of schema research for mass media scholars. In the absence of a trough full of literature in the communications concerning schema application, an illustration of its potential utility based upon a recent event will be sketched.

President Aquino in the Philippines recently captured world and national attention by striking a chord rooted in human rights and democracy. National and world attention quickly focused on the Pacific island because it presumably activated a related and well defined schema--that of people taking charge of their lives.

Effectively striking a well defined communal schema inevitably paves the way for transmission of information capable of striking a collective chord among audience members thereby leading to enhanced audience loyalty and increased size.

EXAMPLES OF SCRIPT MEASUREMENT APPROACHES

Research literature from the past decade clearly suggests that people share stereotypical scripts. Cultural norms, for example, dictate the set protocol be employed in the course of dining out at a restaurant. These norms lead to shared conceptual images of typical action-based events or consensual script. But this research does not to imply that scripts are identical or congruent between people. The restaurant script of a wealthy person may include tipping of the maitre d'--an attribute not necessarily included in the dining out script of the less well-to-do.

But how might media researchers utilize such research? A series of hypothetical examples will be provided intended to provide an explanation of the potential applied significance of schema measurement in media research.

Suppose the anchorman on the evening news reports that an automobile accident has taken place. Mere mention of the accident may prompt people to visualize the scene of an automobile accident. Generic accident pictures based on prior experience and stored in the mind will be summoned to create a generic accident script. More of the script may be filled in if a person is told that an antique Corvette and a school bus collided. And more still if the person knows that the accident occurred at the corner of Elm Street and Vine. But will the person attend to information about the accident provided on the evening news? The answer is yes if the information is schema relevant. But if people share consensual schemata, what makes an

event schema-relevant for one person and schema-irrelevant to another. The following example from political science may help top clarify the picture (Converse, 1975, pg. 97).

EXAMPLE 1

"If an informed observer hears a surprising policy statement in the news by the secretary of defense, he may prick up his ears and pay close attention. He related this information to what he knows of recent policy, what he knows of the secretary's relationship to the president, what he knows of past positions the secretary may have taken, and the like, since he is intensely interested to detect even small reorientations of national policy. In short, he automatically imports enormous amounts of prior information that lends the new statement high interest.

The poorly informed person hearing the same statement, finds it as dull as the rest of the political news. He only dimly understands the role of the secretary of defense and has no vivid image grounded in past information as to the inclinations of the current incumbent. His awareness of current policy is sufficiently gross that he has not expectation of detecting nuances of change. So the whole statement is confronted with next-to-no past information at all, hence is just more political blather: in five minutes he probably will not remember that he heard such a statement, much less be able to reconstruct what was said.

This example clearly illustrates the range of different political schemata possessed by two different people. In order to measure consensual schemata, it will be essential to measure schemata in a relatively large sample and then find the mean. Lau developed his typology of schemata typically employed in political information processing from the election studies carried out by the Center for Political Studies at the University of Michigan. This typology will serve as a starting point in political schema measurement since it offers the opportunity to evaluate several of the fundamental political concepts. It is in

no way exhaustive--indeed--more or fewer categories could be utilized. However, it seems to offer broad knowledge bands while prescribing certain specific characteristics to each component of the typology. The typology includes issues, political parties, candidate (politician) personality factors and attributes associated with specific social groups. While information managers and most people use each of these schemata at certain times, it seems possible that people may use greater or lesser numbers of these schemata based upon individual differences such as expertise. Consider this example.

EXAMPLE 2

Suppose that 70% of the people who are exposed to political information through the television news media rely primarily on their 'politician' schema in interpreting the information. And suppose information suppliers typically invoke the 'issues' or 'party' schema in the course of presenting the information.

Neither the audience nor the information supplier derives maximum utility from the message under this scenario. Quite simply, the messages are presented in a manner which is difficult for the majority of the people to process. And the information supplier runs the risk of losing audience members unable to process the information.

Schema measurement is essential to evaluate which schemata, and to what extent these schemata, are used by members or segments of the audience. Thus specification of shared schemata among people is essential if media information suppliers ultimately wish to provide information in a highly processable fashion to a definable (presumably large) audience segment or collection of segments.

Recall testing of information processing is related to information recall. Social psychologists suggest that accurate

and abundant recall reflects efficient information processing. And the literature suggests that recall testing is an essential element of all script measurement. But heretofore, the specifics concerning recall measurement have been skirted. This will be remedied in the example to follow.

Hypothetical Example Of Recall Testing

Consider this scenario. A group (N=100) of individuals is asked to view a television newscast with equivalent amounts of the four types of political information identified by Lau. The independent variable will be goal directed information processing and the dependent measure will be absolute recall. Fiske, Kinder and Larter (1983) have done work similar to the example below.

EXAMPLE 3

Suppose a sample (N=100) is divided into five equal groups (N=20 per group). They are asked to view political stories embedded in a newscast. A total of 20 political facts is provided. (Five facts for each of the four schemata are offered).

Group 1 is told they will be asked to recall party information. Group 2 is told they will be asked to recall candidate (politician) personality factors. Group 3 is told to recall issues information. Group 4 is told they will be quizzed on group information. Group 5 (control) is told that they will be asked to recall the information in the newscast. Each subject views the newscast.

Each subject is then asked to recall the information they were directed to process. After this task is complete, they will be asked to recall each of the other categories of information. Each response might then coded using the four-part typology for political information (issues, groups parties or politicians). The results will be subjected to an ANOVA in which goal directed processing may serve as the independent variable and recall of information specific to the categories will serve as the dependent measure.

A hypothetical ANOVA table has been provided below. The data suggest that each group successfully performed the task of processing the specific information requested better than the other three types of information. However, the table also suggests that people tend to process group oriented information (mean recall = 2.8) with relative ease and issue related information (mean recall = 1.6) comparatively poorly.

HYPOTHETICAL MEAN RECALL OF POLITICAL INFORMATION IN NEWSCAST
Knowledge Set

Dep. Var.	Group (N=100)	Info. Type	Party	Cand.	Issues	Group	Mean Recall
Total	1 (N/20)	Party	2.8	1.6	1.2	2.8	2.1
Recall	2 (N/20)	Cand.	2.1	2.8	1.3	2.7	2.2
	3 (N/20)	Issue	2.0	1.7	2.0	2.5	2.1
	4 (N/20)	Group	2.0	1.8	1.4	3.2	2.1
	5 (N/20)	Control	1.8	1.9	2.1	2.6	2.1
			2.1	2.0	1.6	2.8	

Information yielded from this table may guide media information managers on efficiently supplying information to the people. It may also for example, alert media managers to the possibility that people in a given market process information concerning issues poorly. Therefore, special attention may be paid to the manner in which issues are portrayed through the media. Clarification and simplicity in presentation are essential for effective message transmission.

The results of the measurement approach above may provide useful and employable guidance for programming based on consensual schemata for the general populace. However, this approach can be easily modified for specialized audiences. Suppose for example that a programmer decides to tailor the message for political elites.

He may simply follow the path forged by Fiske, Kinder and Larter (1983) in measuring the processing abilities of specific audience segments. Using political involvement, for example, as a criterion variable, news managers may study processing tendencies of specific audiences.

Hypothetical Example Of Adjusted Ratio of Clustering (ARC)

The second measure known as the adjusted ratio of clustering (ARC) method (Bousfield & Bousfield, 1966; Ostrom, Pryor & Simpson, 1981; Roenker, Thompson & Brown, 1971) indexes the deviation of clustering from levels based on chance. Clustering in free recall identifies the presence of schemata by demonstrating that items within similar categories tend to cluster. Conceptual clustering of concepts provides evidence that people do group thoughts and ideas--a major assumption underlying the schema theory

Schema theory suggests that people cluster similar concepts as a strategy to organize social information. Suppose for example that a group of subjects are read a list of words that contains the names of animals randomly interspersed among the names of flowers. Researchers have found that the order in which items are listed in free recall reflects their association in organized memory. Specifically, subjects with well defined animal and flower schemata will cluster the animals in one part of the recall sequence and flowers in another (Ostrom, Pryor, & Simpson, 1981).

A number of indices for clustering of free recall have been

proposed. The relative advantages and disadvantages of many of the early clustering methods have been outlined by Shuell (1969). But one method--the Adjusted Ratio Clustering (ARC) technique--has correlated highly (.90) with other measures (Ostrom, Pryor & Simpson, 1981). For this reason, it alone will be considered. The score derived from ARC measures represents the ratio of obtained category repetitions above chance to the total possible category repetitions above chance (Ostrom, Pryor and Simpson, 1981). The following equation represents the theoretical ARC clustering formula.

$$ARC = \frac{R - E(R)}{\text{Max } R - E(R)}$$

Where R = the total number of observed repetitions. (A repetition is defined as occurring anytime two items from the same conceptual category are reported contiguously.)

E(R) = the chance number of category repetitions.

Max R = the maximum number of category repetitions

To employ this technique, adjacent pairs of items must be tallied. Since the raw number of adjacent pairs is confounded with total recall of each type, the clustering scores have to be adjusted for the number of pairs expected by chance (Fiske, Kinder & Larter, 1983) which in turn is a function of the number of items in a given topical domain.

Suppose a researcher was interested in demonstrating that the 'issues' concepts cluster together. The following applied formula may be employed in conceptual cluster analysis.

$$ARC = \frac{\sum_{i=1}^n R_i - [M_i \sum_{i=1}^n (N-1) \frac{1}{2} k_i]}{(n-k) - [m \sum_{i=1}^n (n-1) \frac{1}{2} k_i]}$$

where R_i = observed number of pairs (issues)
 m_i = total recall (issues)
 M = total recall (issues, politicians, party and groups)
 k = number of categories = 4
 n = maximum possible number of category repetitions

The same formula will be used repeatedly for each of the four concepts. The numbers generated will be summed according to group and averaged. They will then be submitted to another ANOVA test in the following manner.

EXAMPLE 1

Suppose that two people with different levels of political expertise are asked to watch a television newscast which contains several political stories. And they are directed to pay attention to information that concerns social groups. The total number of facts provided for each category of information (parties, groups, issues and candidates) is five for a total of 20 facts. The first person (Pa) recalls all of the groups information contiguously and the clusters related concepts in a bunches. The second person (Pb) recalls very little of the information and none of the concepts are clustered contiguously.

Such that:

Pa = AAAAADBBBCCBCCCCDDDD
 Pb = ABCDABCD

where Pa = the political "expert"
 Pb = the political "novice"
 And A = facts recalled concerning political "groups"
 B = facts concerning political "parties"
 C = facts concerning "politicians"
 D = facts concerning "issues"

Using the formula provided, it is possible to generate a coefficient for clustering where perfect clustering in this case would be .262 (as with Pa), and poor recall with no clustering would represent be -.35 (as with Pb). Clustering of 1.0 is possible only when a single category stimulus is invoked. When multiple categories are invoked, the perfect score drops.

A demonstration of this techniques may help.

Pa=AAAAADBBCBCCCCDDDD

Subject Pa clustered all of the A's (group concepts) together for a total of four pairs. This person recalled five A's (group concepts). Total recall for A's (groups), B's (parties), C's (politicians) and D's (issues) was 20. The number of categories is four (issues, parties, politicians and groups). The maximum number of category repetitions for A's is four.

Therefore:

$$\begin{array}{lcl}
 R_i = 4 & & \\
 m_i = 5 & & \\
 N = 20 & & \\
 k = 4 & & \\
 m = 4 & &
 \end{array}
 \quad
 \begin{array}{l}
 2 \\
 4 - [5 \frac{2}{4} (20-1) \frac{2}{4}] \\
 \text{ARC} = \frac{2}{(20-4) - [4 \frac{2}{4} (20-1)]} = \frac{3.67}{15.15} = .242
 \end{array}$$

HYPOTHETICAL CLUSTERING OF POLITICAL CONCEPTS Knowledge Set

Dep. Var.	Knowledge Level	Info. Type	Party	Cand.	Issues	Group	Mean Cluster
Total Clust. (Pa)	Expert	Party	.21	.14	.17	.18	.18
		Cand.	.18	.22	.21	.19	.20
		Issue	.08	.14	.23	.20	.16
		Group	.12	.17	.19	.24	.18
Novice (Pb)	Novice	Party	-.26	-.23	-.30	-.35	-.29
		Cand.	-.30	-.28	-.19	-.35	-.28
		Issue	-.26	-.24	-.05	-.35	-.23
		Group	-.34	-.07	-.05	-.35	-.20

A visual inspection of clustering table offers evidence that may supplement and corroborate the recall table demonstrated earlier. Specifically, the individual with the well developed political schemata (expert = Pa) clustered facts related to the processing of political information better than novices. Such a finding would be of little surprise. However, by combining and averaging the cluster scores of all of the individuals it is

possible to predict which components of the information will be most easily processed by the greatest number of people. Furthermore, as with the recall example, information may be programmed for specific segments by grouping political experts and novices separately.

It should be noted that the largest possible coefficient for any category in this example is .24. By adding individual cluster scores together, it is possible to obtain an overall picture of total clustering. And of course, a perfect score for clustering in all categories would yield a 1.0. In some cases where clustering and recall are extremely poor, the coefficient can go below -1.0. This instance is illustrated above. For example, summing the group scores above will yield -1.40. This suggests that positive and negative scores do not have precisely the same meaning. However, Ostrom, Pryor and Simpson (1981) note that negative scores larger than -1.0 are the exception rather than the rule.

It should also be noted that the ARC formula indirectly tests recall as it tests clustering. Recall is a prerequisite for any form of clustering. Concepts cannot be clustered if they cannot be recalled. Thus the recall and clustering tables should tend to reflect the same sorts of trends--although differences are not uncommon. But taken together, they are assumed to reflect the presence of an action schema or script.

Hypothetical Example Of Inferential Testing

The third approach involves evaluation of inferential capabilities. Typical inferential tests involve asking members of the subject pool to infer from information not provided in the knowledge set. The following example should facilitate an understanding of this approach.

EXAMPLE 2

Fiske, Kinder and Lerter (1983) examined knowledge-based strategies in political cognition as a function of expertise.

Student subjects were divided into experts and novices based upon measures of political involvement developed by the University of Michigan's Center for Political Studies for use in their national surveys.

Subjects read a description of a previously unknown third world country (Mauritius) after being told that it was communist, democratic or unspecified. Concepts typically associated with democracies and communistic forms of government were interspersed throughout the article. An example of a democratic concept was "An open and free press keeps Mauritian citizens informed about national events and what is going on in government." An example of a communist concept is "Mauritians generally do not speak out in opposition to the government." Subjects were not told that Mauritius is actually a British island in the Indian Ocean.

The subjects in this experiment were then asked to make inferences about Mauritius. They were asked questions like "How easy or difficult do you think it would be for a citizen to emigrate from Mauritius?" Note that none of the inference questions were directly addressed in the text. All responses were provided on anchored 9-point scales.

The sum of these mentions was submitted to an Analysis of Variance (ANOVA) on expertise (high/low) by description (communist/democratic). The data suggest that novice or low-involvement subjects made inferences that were more consistent with the set (or label) provided, while experts made inferences more influenced by inconsistencies in the description.

The study conducted by Fiske, Kinder & Lerter (1983)

suggests that the political novices simply began the formation of schemata based on the facts provided and the label given to the text. The political elites conversely used discrepant information and inconsistencies in formulating responses. The results suggest that differences in processing, based on available schemata, exist in the course of processing information.

RELIABILITY AND VALIDITY

Reliability concerns are paramount with regard to schematic measurement since this research area has only recently emerged and is therefore comparatively unexplored. It has been noted that schemata cannot be directly measured and that researchers must often rely on indirect measures such as recall examinations, clustering in free recall (ARC), and inferential testing. It has also been pointed out in the literature review that these measures have recently been used concurrently to cross-check each other.

Multiple indicators are typically used to assess the reliability of the schema measures obtained. Several measures taken concurrently reflecting similar patterns of processing are believed to validate each other. Social science research is generally trusted only when several measures demonstrate a trend, especially when the focus of the research is in a relatively new or unexplored measurement domain (Simon & Burnstein, 1969). Schema researchers have used several techniques to get at the

composition of these organized knowledge structures. But the single measure that permeates virtually all of the literature on script measurement is that of recall testing.

Recall testing has been employed in most of the studies during the past decade (Anderson & Pichert, 1978; Bower, Black & Turner, 1979; Rothbart, Evans & Fulero, 1978; Fiske, Kinder & Larter, 1983; Fiske, Taylor, Etcoff & Laufer, 1979; O'Sullivan & Durso, 1984; and Snyder & Cantor, 1978). But recall testing alone cannot be considered a reliable measure of schema presence or sophistication. Hence inferential testing and clustering techniques have thus been employed to buttress the argument that recall reflects the knowledge contained within a schema.

The early work in script measurement (Bower, Black & Turner, 1979) relied almost exclusively on recall testing. More recent work has tended to include all three techniques (Fiske, Kinder & Larter, 1983). It should be noted that these two studies cited above appeared in journals within a four year span and that new measurement approaches will likely continue to emerge for the foreseeable future. But it is impossible at this point to assess with any degree of certainty whether any of these approaches is clearly superior to any other. These measurement approaches are so new that neither meta-analyses nor Monte Carlo studies have as of yet been conducted to assess the relative worth of these measures.

In the absence of formal studies of schema validity upon which to draw, the measurement approaches will be critiqued in a qualitative fashion utilizing the formal definitions for "content

validity, criterion related validity and construct validity (Zeller & Carmines, 1980).

Content or face validity is a system of using logic, common sense and previous work in the interest of specifying which variables represent an abstract concept. Schema theory rests on the assumption that a script serves as the central processing model for any given sequence of events encountered by the individual. Individuals with well developed schemata in a given domain will logically recall new information in that domain better than others with poorly developed schemata. Recall thus serves as the dependent measure. Schema theory suggests that the information can be more easily assimilated when a developed schema is available. This proposition seems plausible if not probable from a common sense standpoint.

A person will also logically infer more from a set of information if he possesses a well developed schema. The individual simply has a greater knowledge base upon which to draw and will find it easier to find parallel situations in memory which serve as a model for current incoming information. And individuals well versed in a given topical domain will logically cluster related concepts when asked to do so based upon their enhanced appreciation of the boundaries for a given concept. The professional baseball player will be able to cluster all major league teams. The less interested observer may include several football teams in the list and fail to include several baseball teams.

Criterion related validity is established when the strength

between a scale and a variable can be reasonably gauged. It is the degree to which an operational definition categorizes phenomena in the same way as a well-accepted (or criterion) measurement does. Criterion validity is normally gauged through the use of a correlation coefficient to determine the degree of association between the new measurement and the criterion variable (Phillips, 1985). Criterion validity may come into play in schema measurement especially in development of the measurement instrument and during the coding of open-ended questions.

Script measures typically ask people to recall facts based upon a knowledge set provided by the researcher. Coders must then sort the responses to assess the degree to which people recalled or grouped certain conceptual items. If the sorting categories are too similar, for example, coders may fail to sort the responses in a similar fashion. High intercoder reliability demonstrates appropriate analysis of the data. Criterion validity refers to highly specific elements of the research design rather than the broad concepts assessed in the area of content or face validity. If an experiment is set up in a manner in which people comprehend and perform a given task properly and the data is analyzed such that agreement is strong between coders, then criterion validity is high.

Standardized tests such as the Graduate Record Exams (GRE) typically predict the ability of an individual to perform in graduate school reasonably well. Tests of schema presence may ultimately serve a similar predictive function by providing

guidance for information providers on shared processing abilities. But standardized tests such as GRE examinations have had the luxury of time which has proven their validity with reasonable certainty. Coding of these tests is done in an unambiguous fashion in which a correct (or incorrect) response is selected from several possible answers.

Unlike the GRE tests, schema measurement tests have a limited research tradition upon which to draw. They are especially vulnerable with regard to criterion validity. Concerning schema measurement, the stimulus or knowledge set will ideally be provided to all respondents under similar conditions. Each experimental subject must understand the directions provided by the experimenter. But it is not essential that the stimulus messages be comprehended equally by each subject. It is in fact these differences in comprehension and retrieval that will ultimately serve as evidence of schema presence (or lack of presence). Hence criterion validity hinges vitally upon intercoder agreement, development of an unambiguous data collection instrument and clear articulation of the task to be performed.

Schema measurement is a new frontier for communication and social cognition researchers. One may certainly make the case that schemata do not exist--that the variables measured simply reflect memory or chance clustering. But this argument is precisely the reason that measurement approaches should be explored. And it is this criticism that leads logically into the domain of construct validity.

Construct validity is present if the researcher can demonstrate that a scale measuring an abstract concept is related to other scales. Construct validity typically begins with a hypothesis on how a set of ideas or concepts may be related. Scales must then be developed to measure the concepts. Results consistent with predictions tend to suggest that construct validity is present.

It is precisely this point which has been addressed by researchers during the past three years. Scholars of cognition such as Fiske, Kinder and Larter (1983) have provided several measures on the same responses to demonstrate that the results agree. One may argue that clustering of concepts is hopelessly entangled with recall of facts since facts must be recalled before they can be clustered. But the cluster scores obtained using the ARC measures will be considerably lower if the individual recalls a great deal but fails to cluster related concepts. The scales used to measure scripts including recall, inference and clustering have tended to yield the anticipated results based on formal hypotheses. Agreement between scales, or results tending in the same direction suggest that the schema notion possesses construct validity when proper measurement techniques are employed.

In performing experiments, researchers must be ever mindful of problems associated with internal and external validity. Internal validity is the basic minimum without which any experiment is uninterpretable (Campbell & Stanley, 1966). Critical to the concept of internal validity is the question of

whether or not measurement is able to determine if the experimental manipulation made a difference in a particular instance. The research described in this report demonstrated clearly that people share consensual schemata and that individual differences account for variation in schemata usage and availability.

Internal validity is rarely a problem in properly conducted experimental research characterized as a posttest-only control group design. Campbell and Stanley note that all of the factors associated with internal validity (history, maturation, testing, instrumentation, regression, selection and mortality) are all controlled in this design. It is in the domain of external validity that this design is called into question.

External validity pertains to the generalizability of the results of an experiment or to "what populations, settings, treatment variables and measurement variables can this effect be generalized (Campbell & Stanley, 1966)." Virtually all of the work on schema measurement has been conducted in the laboratory using stimulus materials specifically designed to evaluate schemata. More experiments demonstrating 'real world' applications of schemata will help this construct move toward formal acceptance.

The specific threat to external validity centers on the types of experiments which have been carried out. People have typically been tested on consensually shared scripts of a simple nature such as ordering a meal in a restaurant. Or tested on recall of facts pertaining to broad generic concepts based on a

powerful concept such as democracy or communism. But do people routinely employ scripts in the processing of day to day news information? Do people employ different types of schemata in the course of processing specific types of information provided by the news media?

To avoid ending on a string of questions, it must be acknowledged that the external validity of these measures is in question. Researchers have done little to assess the degree to which people employ scripts in the course of processing news and information. Viewing a newscast with information concerning the American response to Libyan rocket fire over the Gulf of Sidre will likely cause an individual to summon schemata different from those that may be employed in the course of processing a passage on the island of Mauritius.

Hence the time is right to begin assessing the degree to which these measures may be considered externally valid. And the path to be followed in this regard involves using 'real' news and information for stimulus materials rather than hypothetical passages. The measurement approaches discussed will serve as a foundation for more elaborate approaches. The schema concept still needs some ripening--and measurement approaches will aid in this area. But as Fiske and Linville (1980, pg. 553) note, "the most clear-headed overall view of the schema concept--or of any other newcomer--is to let a thousand conceptual flowers bloom."

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